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Monthly Fire Behavior Patterns

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ABSTRACT: From tabulated frequency distributions of fire danger indexes for a nationwide network of 89 stations, the probabilities of four types of fire behavior ranging from 'fire out' to 'critical' were calculated for each month and are shown in map form.

Have you ever wondered how the fire weather in your area compares with that in other parts of the country? Or why in summer there are usually many large fires in the West but relatively few in the East? If so, a series of studies conducted jointly by the Forest Service and the Weather Bureau and sponsored by the Office of Civil Defense provides some answers to your questions.

First, we had fire-weather specialists from all regions of the United States identify the weather types associated with critical fire weather in their areas. Then we tabulated the frequency distributions of fire danger indexes for a network of 89 stations covering the 48 contiguous States.[1] Fire danger data were then combined to show the level of fire danger to be expected with each weather type.[2]

Finally, we established four types of fire behavior based on the fire danger indexes and determined the probability of occurrence of each by type, by months, for each station.[3]

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[1] Schroeder, M. J., et al. Synoptic weather types associated with critical fire weather. Pacific SW. Forest & Range Exp. Sta., U.S. Forest Serv., Berkeley, Calif. 492 pp. 1964. Copies of this report may be purchased from the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Virginia 22151.

[2] Hull, M. K., O'Dell, C. A., and Schroeder, M. J. Critical fire weather patterns--their frequency and levels of fire danger. Pacific SW. Forest & Range Exp. Sta., U.S. Forest Serv., Berkeley, Calif. 43 pp., illus. 1966. Copies of this report may be purchased from the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Virginia 22151.

[3] Chandler, C. C., and Schroeder, M. J. Probability of effective post-attack fire-fighting in wildlands. U.S. Office of Civil Defense Res. Rep. 10, 9 pp. 1965. (Limited distribution.)

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The four types of fire behavior are as follows:

Fire Out:	Sustained ignition in natural fuels will not occur.
No Spread:	Sustained ignition will occur, but the resulting fires will not spread beyond the radius of initial ignition and will go out by themselves unless the weather becomes more favorable for combustion.
Actionable:	Fires will start and spread, but their intensity and rate of spread will be such that successful control efforts are possible.
Critical:	Fire spread and intensity will be such that successful control efforts are unlikely under post-attack fire-fighting limitations.

For this note, the probability of the fire danger index falling into each of the four types for each station and each month was calculated from the original frequency distributions and plotted on an appropriate map (figs. 1 - 12).[4]

The four types of fire behavior are mutually exclusive. Taken together they include all possible types of fire behavior. Thus, for any given station the sum of the probabilities of the four is unity.

Isolines were drawn for intervals of 0.1 probability to show at a glance the areal pattern. Areas of zero probability were shaded, and areas where the probability of "Actionable" or "Critical" is greater than 0.5 were hatched.

Although these maps are intended primarily for civil defense purposes, they can also be useful in normal peacetime fire planning. The seasonal changes in fire danger are clearly shown. For example, during the winter months, portions of the Southwest have a high probability (over 0.5) of "Actionable" conditions. During the spring, this condition spreads to the north and east, fluctuates somewhat in the Southeast in summer, then retreats again to the Southwest as winter approaches.

In using the probability maps it must be understood that the fire danger index used is based only upon weather conditions; fuels and topography were not included. Sparse or heavy fuels and steep or flat terrain are

[4]Thanks are due Mrs. Sara L. Breuer for calculating the probabilities and plotting them on maps.

additional factors in determining whether fire-fighting efforts will be effective, and must be considered. Snow on the ground was not considered directly in calculating the fire danger index. In most instances, when the ground was snow-covered, the other weather elements were such as to result in low fire danger indexes. This is not always the case, however, and the probability of the ground being snow-covered is additional information that can be considered in fire-control planning. Such probability maps were published in a previous report.[5]

The Authors

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[5]Schroeder, et al. Op. cit.

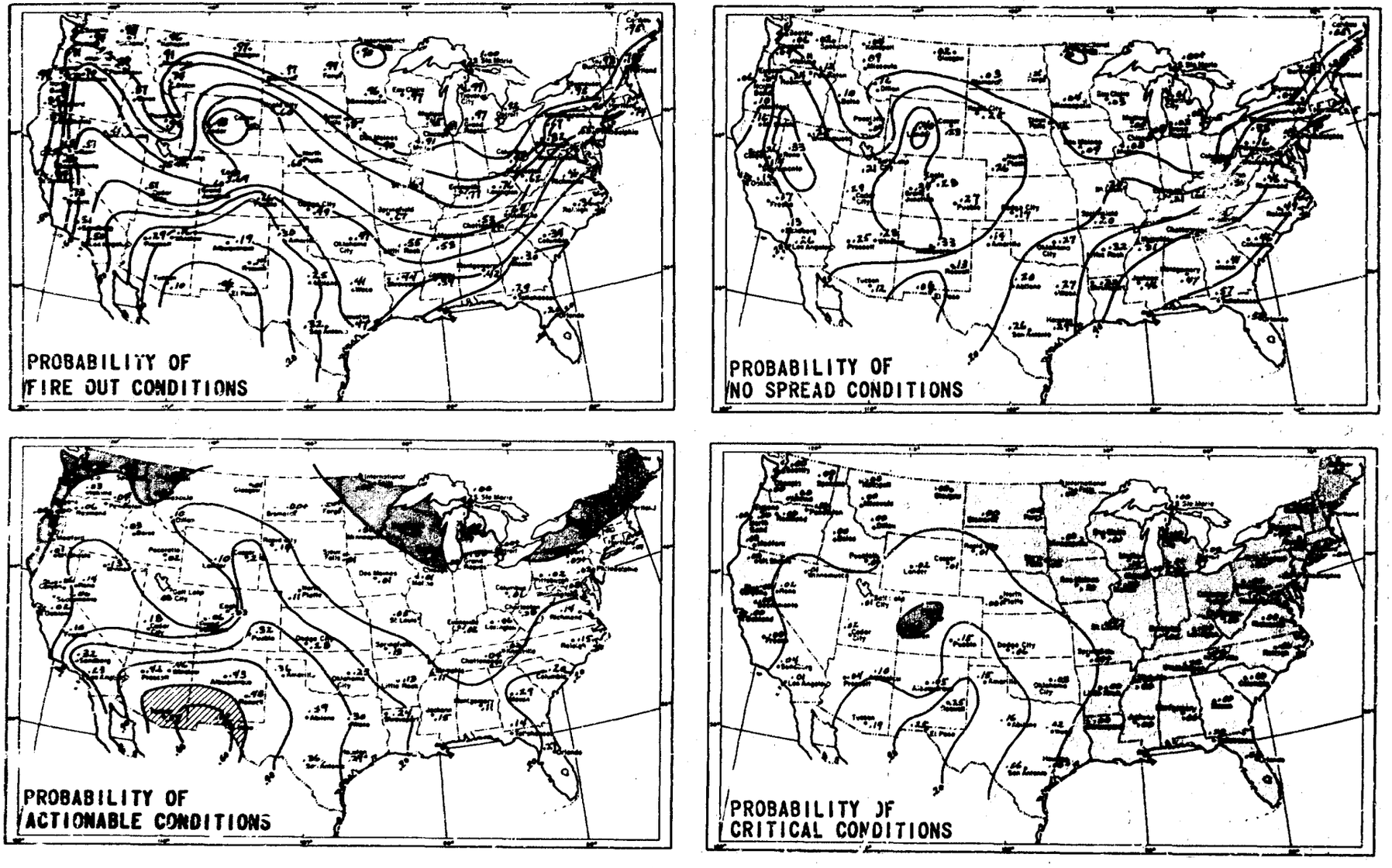

Figure 1.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in January 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

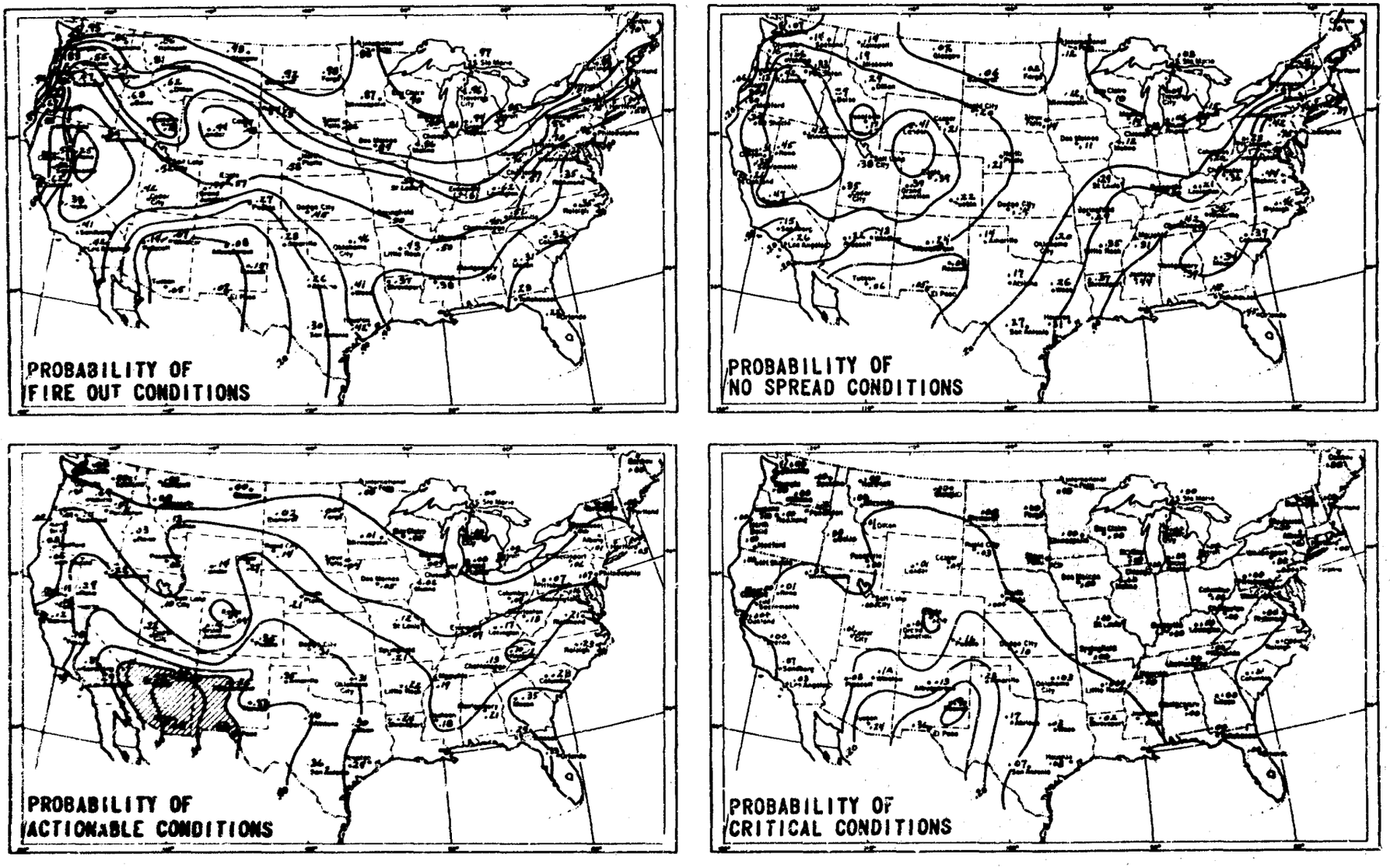

Figure 2.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in February 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

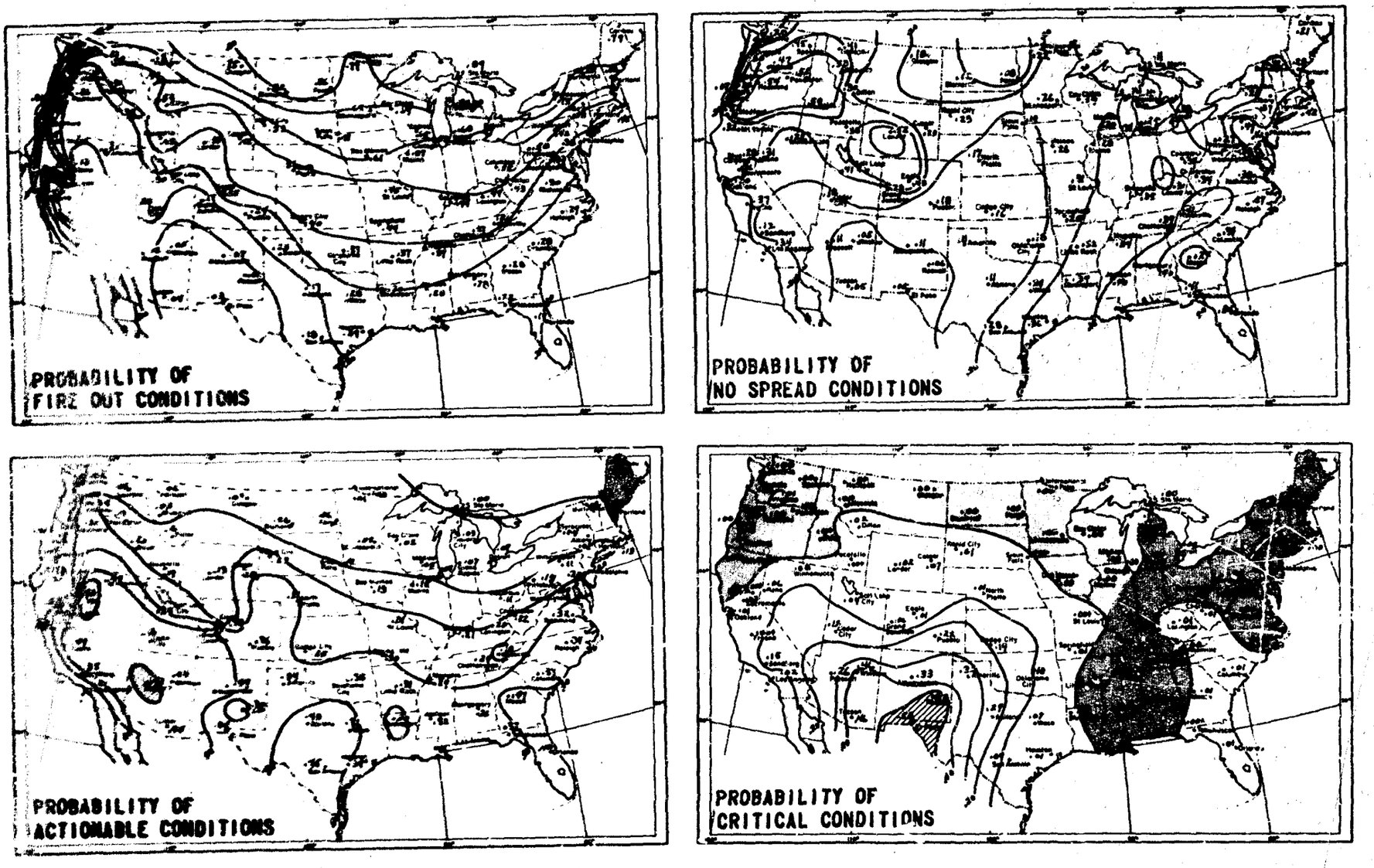

Figure 3.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in March 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

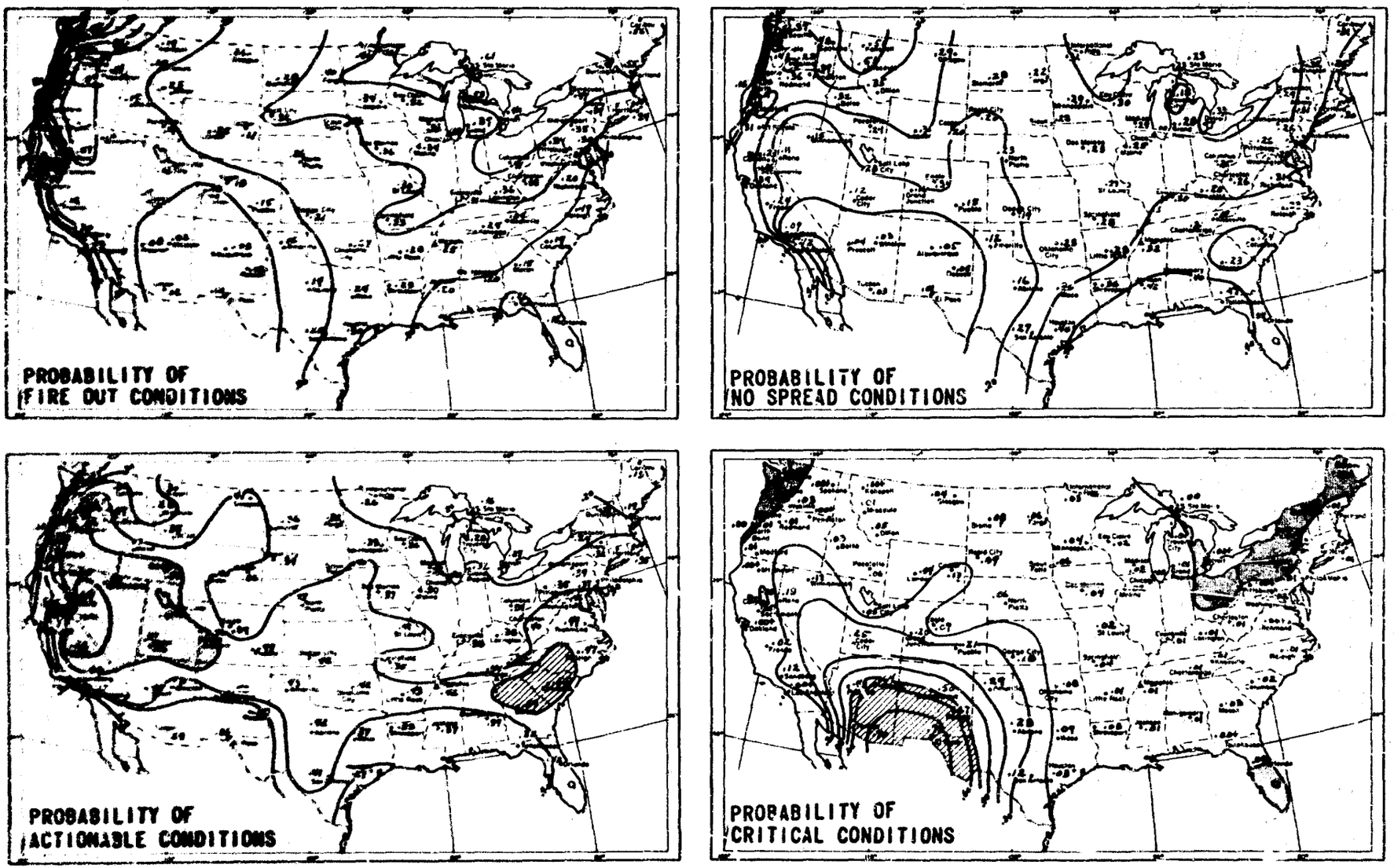

Figure 4.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in April 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

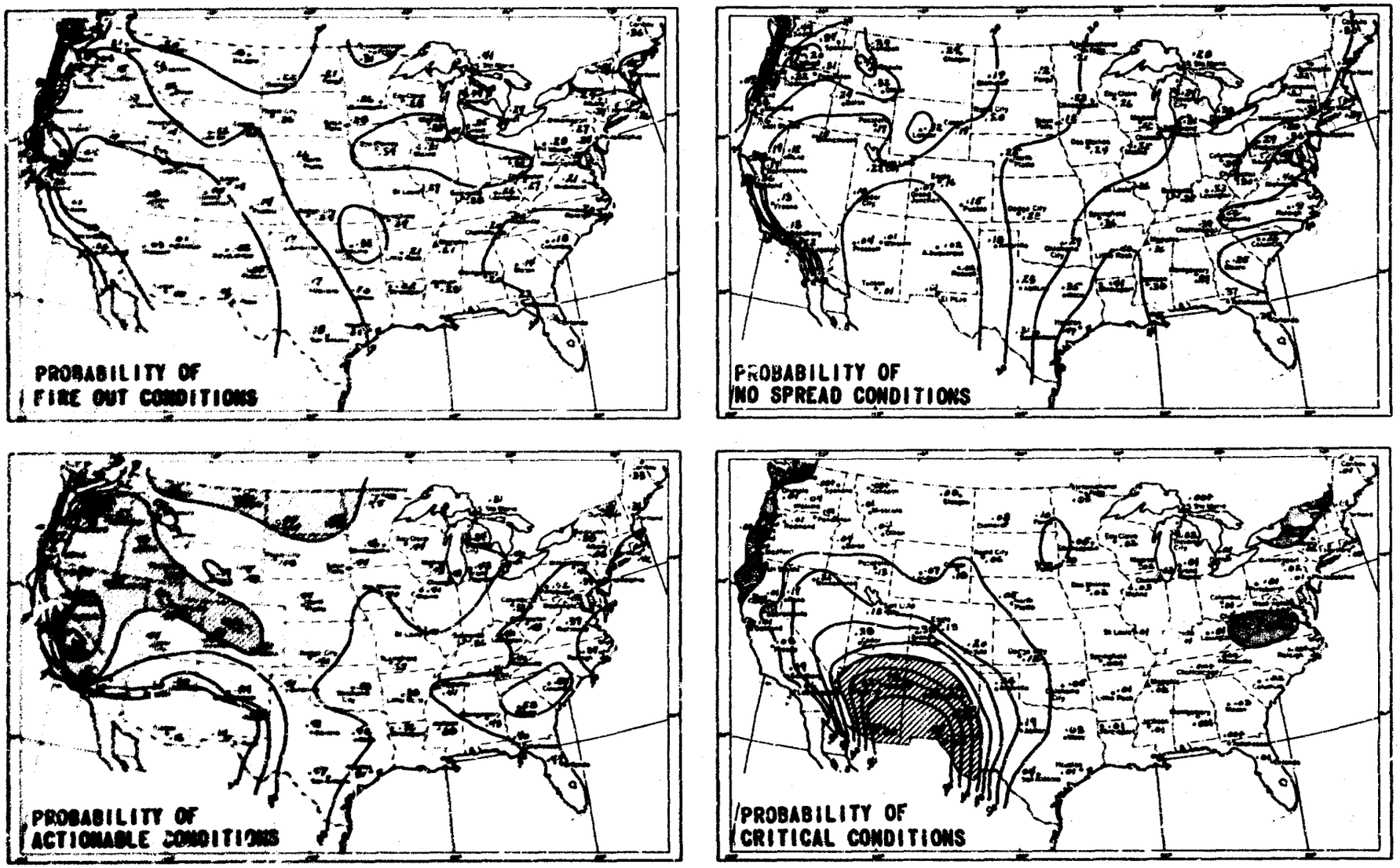

Figure 5.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in May 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

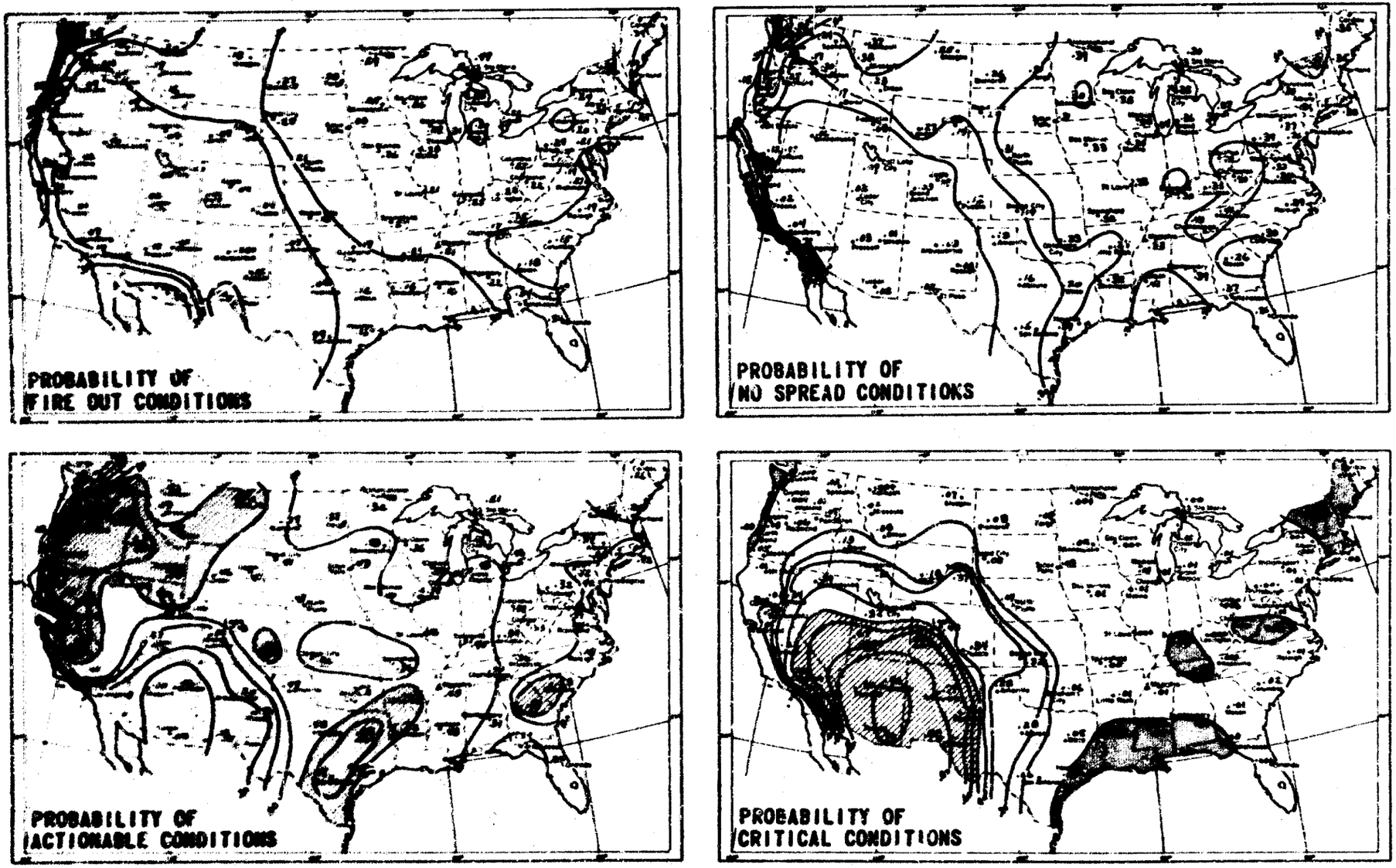

Figure 6.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in June 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

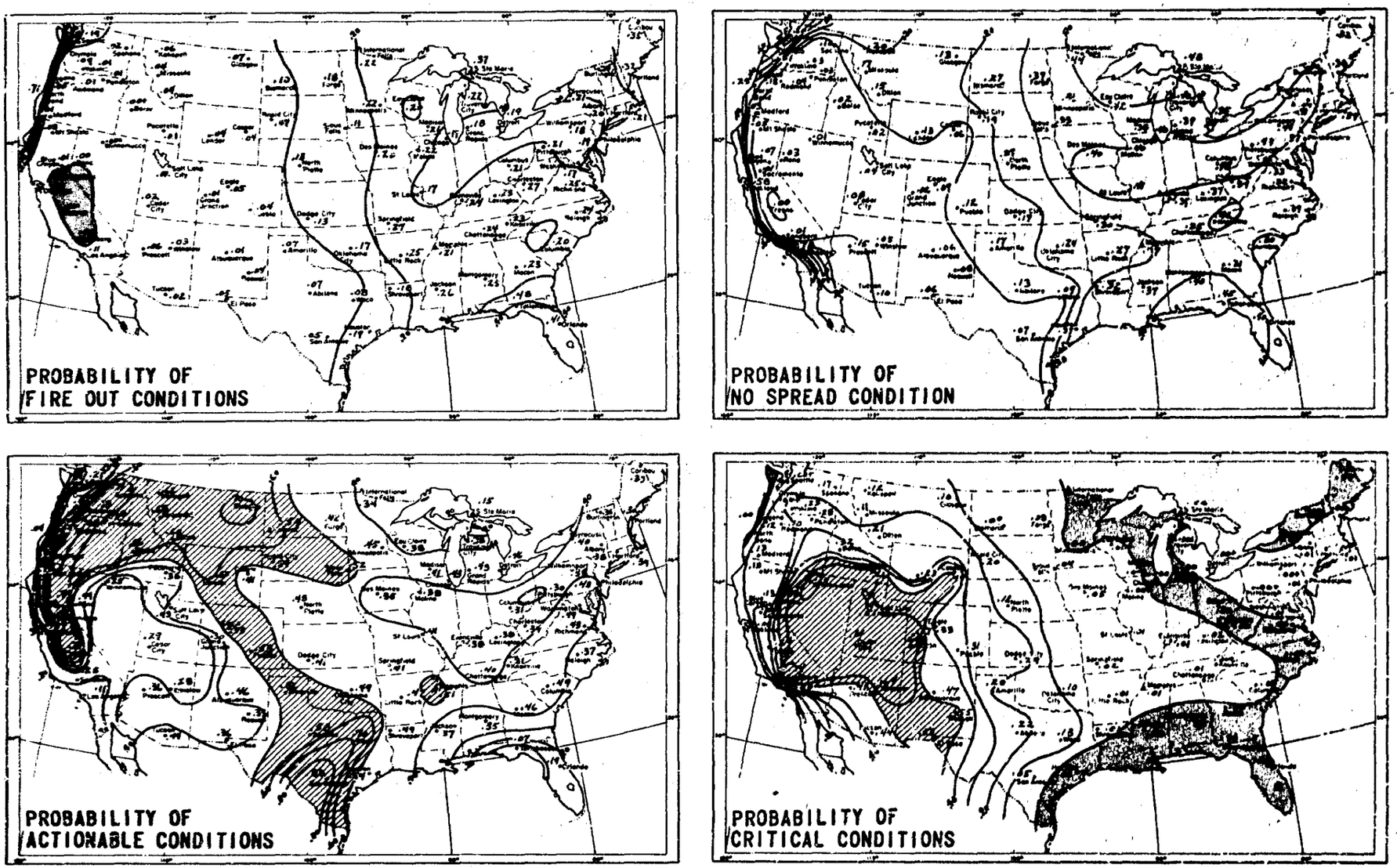

Figure 7.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in July 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

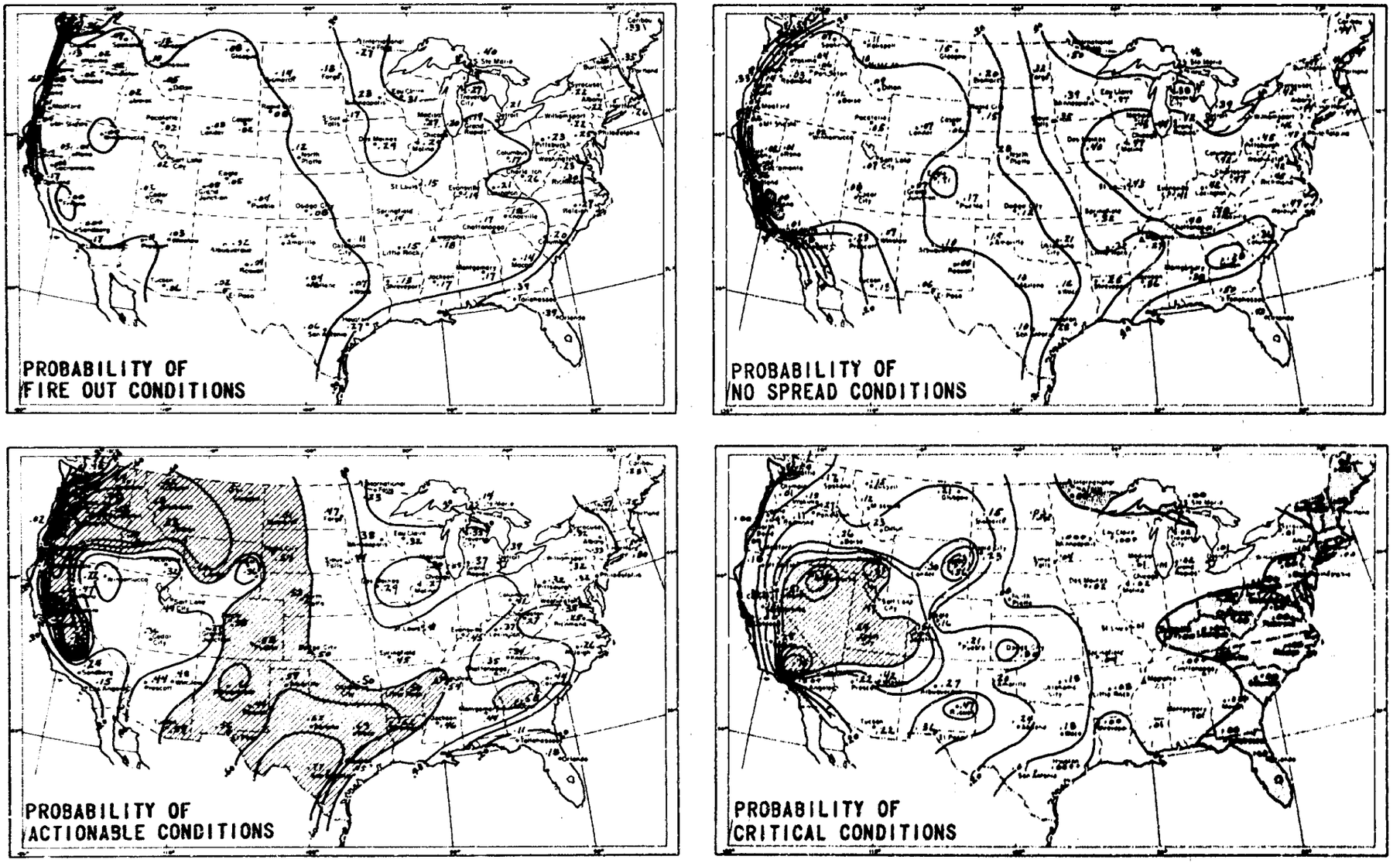

Figure 8.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in August 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

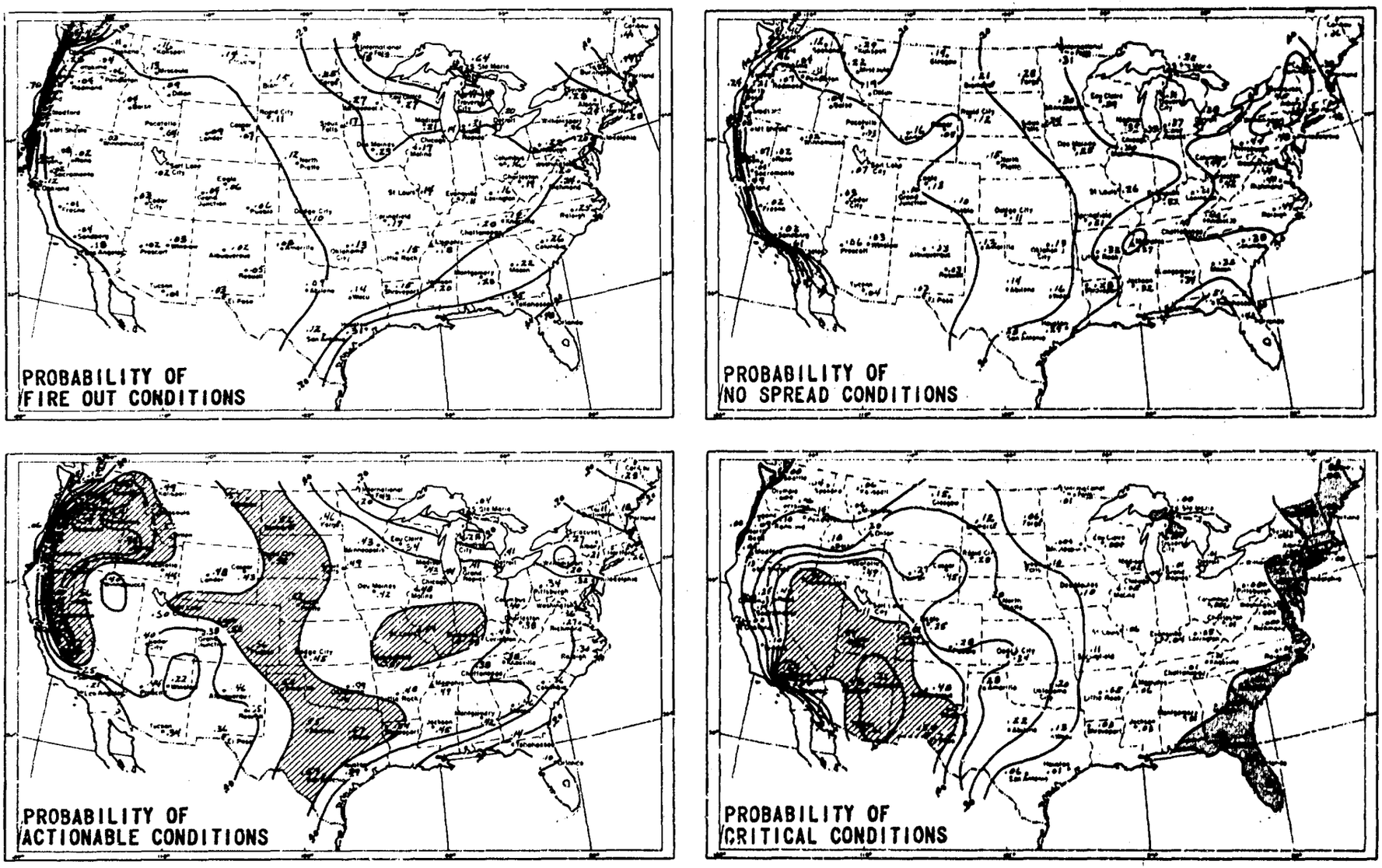

Figure 9.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in September 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

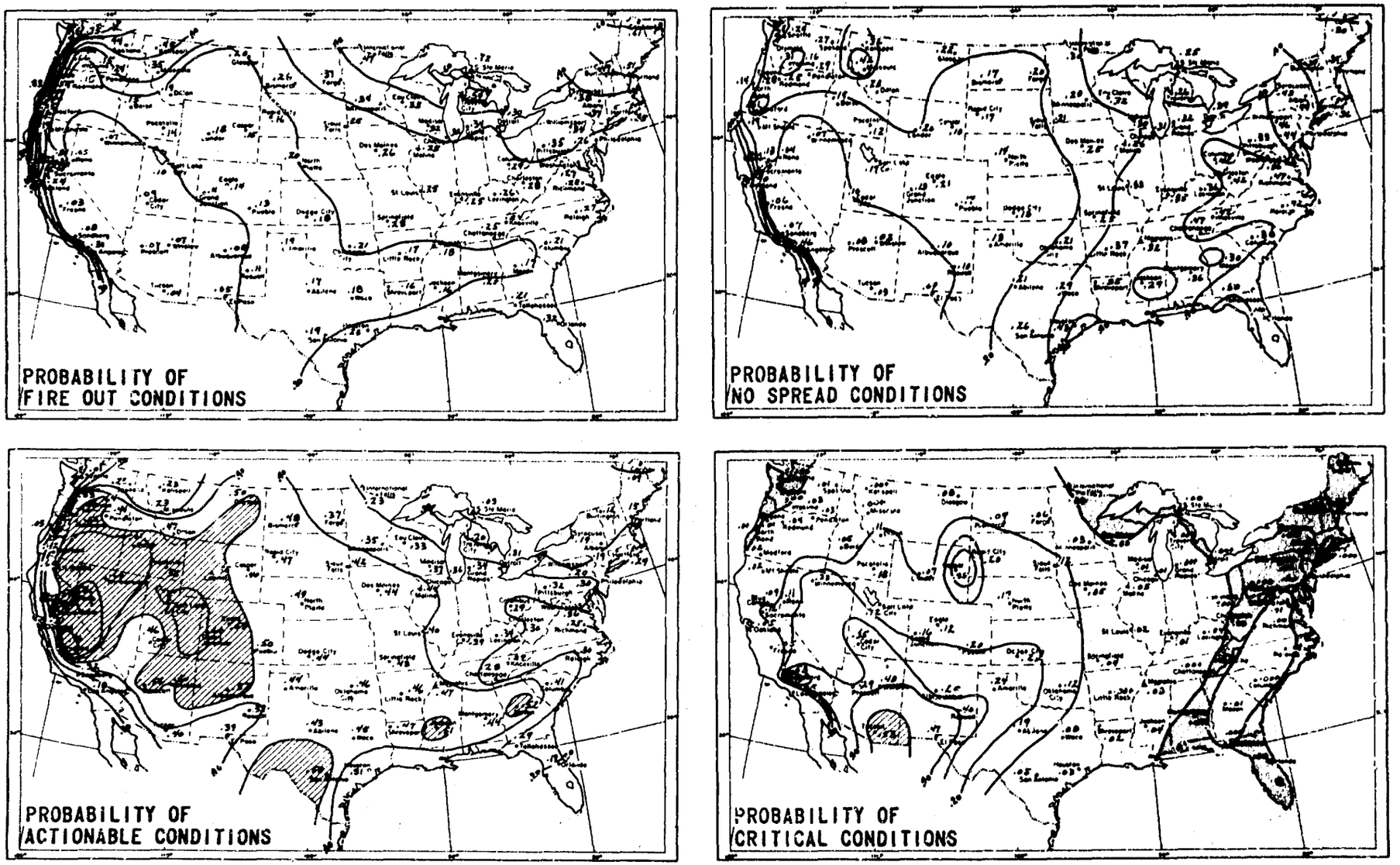

Figure 10.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in October 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

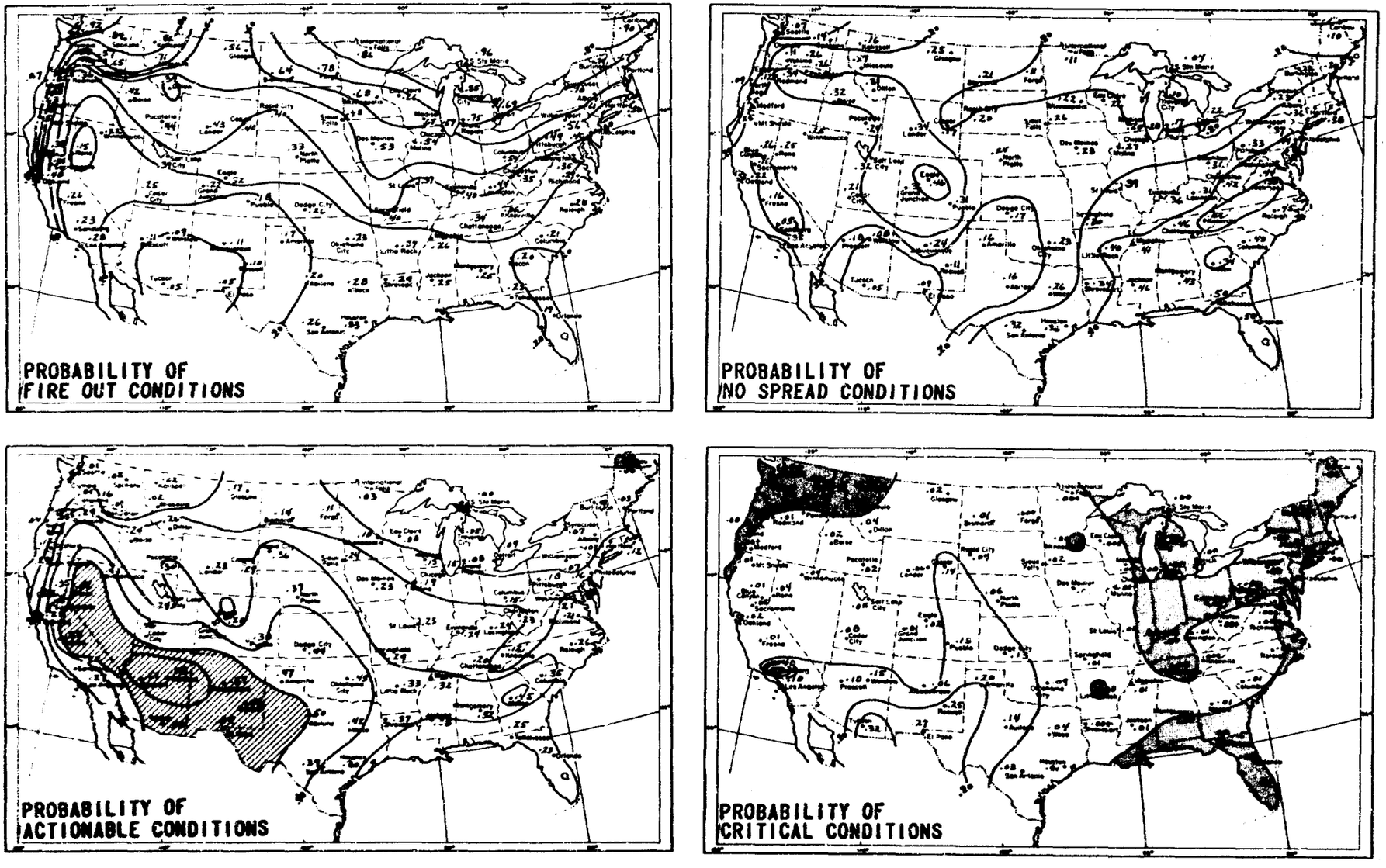

Figure 11.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in November 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

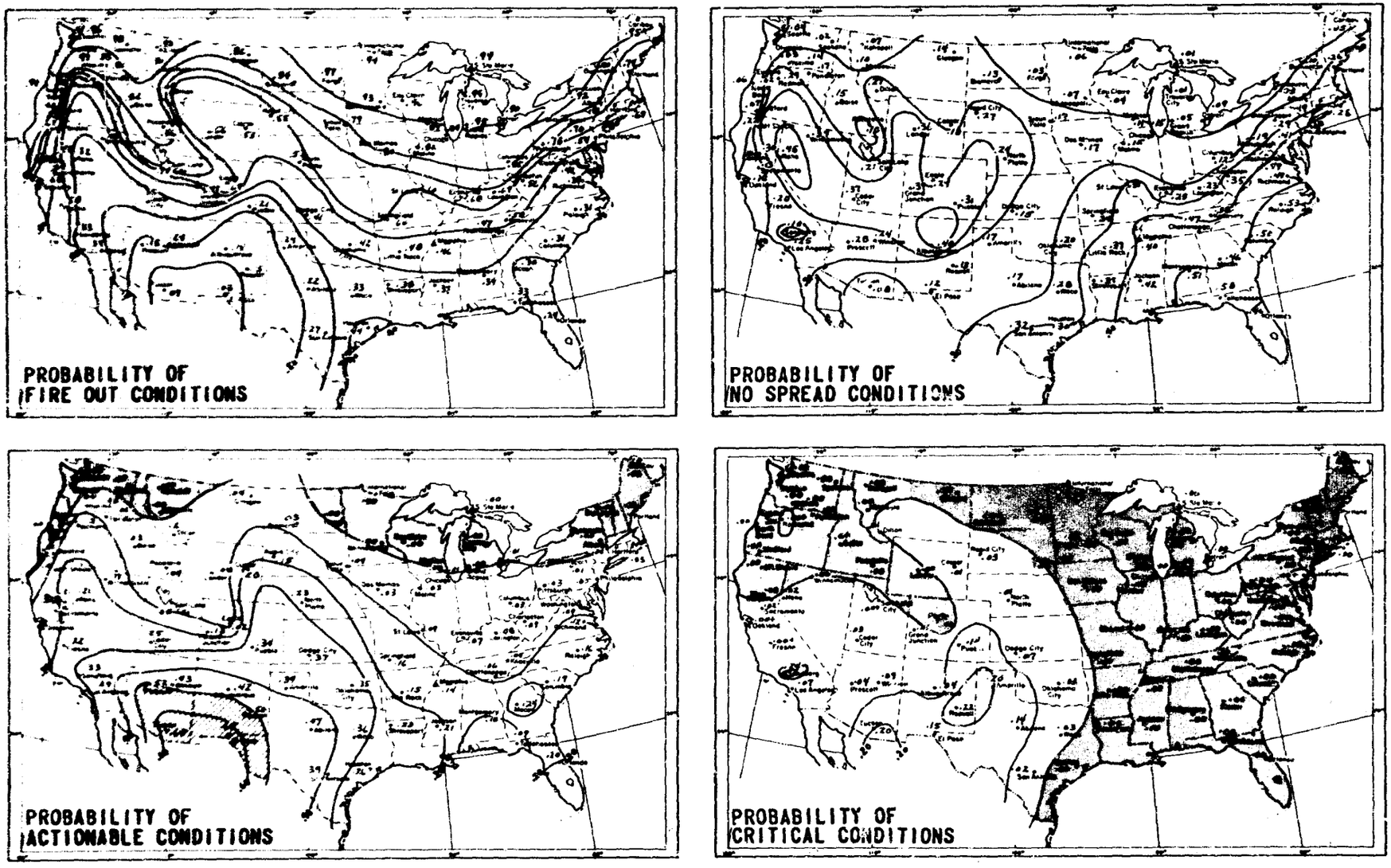

Figure 12.--Four types of fire behavior and their probability of occurrence were developed from fire danger indexes based on weather in December 1951-1960. Isolines are drawn at 0.1 probability intervals. Shaded areas represent zero probability; hatched areas show probability exceeds 0.5.

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